nents. The most difficult of these were ones involving the continuous spectrum of these systems, namely collision problems.

For several decades research in this area languished. The challenge of nuclear phenomena was the vogue, and relatively few research centers in the world devoted their energies to atomic physics. But because the problems of atomic physics were so interesting, and because of their technical importance for other areas of science and engineering, the field could not be denied indefinitely. In the 1950's a marked renaissance of interest in atomic physics in general, and especially in collision problems, took place.

An international conference in this field begun in 1959 has been meeting since then, with ever-increasing attendance. The volume under review is a compilation (in English) of the 15 invited papers from the fifth of these conferences. [The much larger volume of abstracts of contributed papers, edited by I. P. Flaks, has been published separately (available from the Four Continent Book Corporation, New York, $16).]

The collection of papers illustrates very well the two factors which stimulated the rebirth of atomic physics research. Five of the papers indicate the connection of atomic physics to aeronomy, astrophysics, plasma physics, and lasers. These not only describe how research on basic collision processes has extended knowledge in these fields but also discuss which reactions must be understood if this knowledge is to be carried still further. A physicist casting about for something to do can find material for a lifetime of activity in answering some of the questions raised in these papers.

Nine of the papers are on theoretical developments. These illustrate very well by their sophistication and depth the intellectual challenge of collision processes in atomic physics. Two of the most important developments, the obtaining of bounds on cross-sections and the close coupling approximation, were developed, surprisingly, in the context of atomic rather than of nuclear physics. Three of the nine papers are discussions of the contributed theoretical papers given at the conference. Although they make reference to these papers, they really constitute a statesmanlike overview of the state of theory in the field of atomic collisions at this time.

A surprise and a disappointment is the lack of adequate coverage of the experimental aspects of this field. Since the management of the conference was in the hands of the experimentalists and since experimentalists were adequately represented on the planning committee, the omission seems to be a surprising display of delicacy and self-effacement. This is but one of a series of meetings; it represents probably a statistical fluctuation of emphasis of no basic significance. Unfortunately, the one invited experimental paper is not up to the standards of the others in this volume and gives no indication of the scope and importance of experiment in collisional atomic physics.

The style of all of the papers is too broad for them to be of use in immediately transmitting useful information to the research specialist. However, to the student about to embark on research in this area, or to the practicing physicist who wishes to become more catholic in his outlook, the (often extensive) bibliographies make the possession of this volume more valuable than attending the conference.

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Elusive Specimens

In the Wake of the Sea-Serpents. BERNARD HEUVELMANS. Translated from the French by Richard Garnett. With drawings by Alika Watteau. Hill and Wang, New York, 1968. 648 pp., illus. $10.

Only staidly reductionist biologists are willing to categorically deny the existence or possibility of sea serpents, and they will receive little support from *In the Wake of the Sea-Serpents* by Bernard Heuvelmans. This exhaustive and possibly exhausting (if the reader approaches it with a closed mind) work is an examination of the question: "Are there or are there not in the sea one or more species of giant animals, elongated in shape and still unknown to science?" Who, in the face of all the evidence submitted (and summarized in a ten-page list of sightings from circa 1639 to 1966), would dare answer negatively such a question? Heuvelmans is not a retired sea captain compiling random notes of interest or writing hopefully under the influence of the spirits while meditatively puffing an Oom Paul pipe but a professional biologist who has, among other things, made a study of the dugong's teeth. True, he has also "at times made his living as a professional jazz singer," and this will doubtless be counted against him by those who must grab at all possible straws to deny the existence of still unknown monsters. Nevertheless the overwhelming evidence accumulated by Heuvelmans indicates that there is not just one elusive sea serpent, but several kinds of large creatures in the ocean still to be brought to the dissecting table. In fact, there appear to be at least nine kinds of such beasts.

Of these various kinds, the superotter, the merhorse, and the giant yellow-bellied tadpole seem most logical, and it may still turn out that the superotter and the long-necked sea serpent are simply the two sexes of the same animal (the author states that the long-necked and merhorse types cannot be considered sexual dimorphics of the same animal—his punch cards do not fall out that way). Such matters as sex and breeding receive little notice in this compendium of information, incidentally. One of the startling results of this thorough survey of the literature of sightings of large, unidentifiable monsters is the geographic distribution that comes to light. These beasts have not been sighted along any of the Pacific coast of South America or in the vast expanse of the southeast Pacific Ocean, nor are there recorded sightings anywhere in the North Pacific any distance from shore (the merhorse or cadborosaurus has often been sighted in British Columbia waters and near southern California and may be indigenous to the northeast Pacific). This raises the possibility that sea serpents are actually neritic creatures, not wide-ranging, deep-sounding animals, in which case they would certainly have been known to Captain Ahab and his pelagic ilk. Another possibility to be considered is that of mutual exclusion of large cetaceans and sea serpents, which suggests, in line with Gause's hypothesis, that some of these unknown animals may depend on the same food supply as the sperm whale. If that is the case, reduction of the sperm whale stock should be accompanied by an increase in sightings of these large and obviously alert creatures.

This scholarly work has been translated from the French by Richard Garnett, but the English version is not exactly the same book. The first volume of the French version was devoted to the kraken and the giant squid; this has been condensed to a single chapter, and additional sightings of sea serpents have been added. While it may be true,

as the translator says, that "no material passages have been omitted," certainly some delightful immaterial passages seem to have fallen by the wayside. It is to be hoped that this book, complete as it attempts to be, is not the last word on this subject and that soon we may have one of these creatures on display in one of our oceanariums. In the meanwhile, every research vessel should have a copy of this volume in its library, although it may be necessary to chain it to the bulkhead to keep it from going ashore in someone's duffel bag.

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Forestry and Industry

Wood as Raw Material. Source, Structure, Chemical Composition, Growth, Degradation and Identification. GEORGE TSOUMIS. Pergamon, New York, 1968. xii + 276 pp., illus. $10.

This book presents a general, but quite comprehensive, review of the sources and characteristics of wood that affect its use as an industrial raw material. Beginning with a brief description of forest trees as sources of wood, the author goes on to give the reader descriptions of macroscopic, physical, and microscopic characteristics of wood, followed by discussion of its chemical composition and ultrastructure, the mechanism of wood formation, the formation and structure of bark, variations in wood structure, and abnormalities in and degradation of wood, and ends with keys for identification of wood and some material on techniques for microscopic investigation.

The book is written primarily as a textbook for students in fields in which a knowledge of wood is necessary—forestry and its various constituent specialties of forest management, silviculture, tree physiology, forest genetics, forest soils, forest engineering, forest and wood pathology, pulp and paper technology, and wood science and technology. The author also proposes to meet the needs of the wood industry, of engineers, and of architects.

Those objectives are attained only to a limited degree. The treatment is adequate in most respects for those wanting a general knowledge of wood structure and formation. The material is presented in such a way as to be understandable and meaningful to most such readers. However, the presentation of such a broad range of information in a relatively small book has been at the expense of clarity in some places and has resulted in excessive generalization in others. Many of the illustrations are likely to be unclear to a person using the book as an introduction to the field and are thus not consistent with the text in level of understanding required. The book would be useful in a high school or a junior college provided the instructor knew enough of the subject to cope with some of the more general statements. The presentation does not seem adequate for serious students of wood science and technology or pulp and paper technology, for which much more detailed knowledge of wood structure and characteristics is essential.

The book omits any reference to the major strength and related mechanical properties of wood. This would seem to be a serious omission if the book is to be truly useful to engineers, architects, and many in the wood industry.

In spite of these limitations, the book is well worth consideration by those who desire a brief, general treatment of the growth and structure of wood. It certainly has merit for this purpose.

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